WHEN ELECTRONICS WAS YOUNG (10)

In 1888, the American researcher Oberlin Smith (1859–1934) published his thoughts on magnetic recording, which in 1898 led Valdemar Poulsen (1869–1942) to publish a method of recording sound — magnetic recording. Poulsen found that by passing the output current from a microphone through an electromagnet and drawing a piano wire rapidly past it, the wire was magnetized to varying degrees. This could be played again and again and could also be erased and re-recorded. Unfortunately, owing to the materials then available, the design was poor and forgotten until the 1930s when it was revived in Germany with the steel wire replaced by magnetic tape. Today, Poulsen is better remembered for his invention in 1902 of the arc generator for the production of radio waves.

When John Ambrose Fleming (1849–1945) visited Edison during a visit to the USA, Edison showed him a carbon-filament lamp in which a metal plate had been sealed. When the plate was connected to the positive terminal of the filament, a current flowed, which did not happen when the plate was linked to the negative terminal. On his return home, Fleming carried out researches which culmimated in his filing a patent for the first thermionic valve. This consisted of a vacuum tube containing a cathode heated to incandescence by an electric current and an anode. When the anode was maintained at a positive potential with respect to the cathode, an electric current could flow from cathode to anode, but not in the opposite direction. Thus, this two-electrode tube, or diode, acted as a rectifier that could be used to change alternating current (a.c.) into direct current (d.c.).

While Fleming was developing the two-electrode thermionic valve, the American physicist, Dr Lee de Forest (1873–1961) was working on similar lines and in 1906 applied for a patent for a three-electrode vacuum tube — the triode. This device is essentially a diode with an additional electrode (the grid) between cathode and anode, which can be used to amplify weak electrical signals. The amplification is achieved by applying a voltage to the grid with which the anode current can be controlled. Of far greater importance than the diode, the triode was crucial in the development of radio communication, radar, television, and computers. It remained an essential component for over fifty years before it was largely superseded by the transistor.

At about the same time, an Austrian inventor, Robert von Lieben, also carried out research on a three-electrode valve, and applied for a patent in 1906. Unfortunately for von Lieben, his patent was lodged later than that of Lee de Forest and has never been acknowledged outside Austria.

Lee de Forest's work was attacked by Fleming in the courts on the basis that de Forest's invention was dependent on his, Fleming's, diode. De Forest has always insisted that he was not aware of Fleming's patent before taking out his own. The court battles lasted from 1907 until 1943. Originally the courts upheld Fleming's claim that the addition of the grid was dependent on his work, but in 1943 the United States Supreme Court finally decided in favour of de Forest on the basis that the original Fleming patent had always been invalid.

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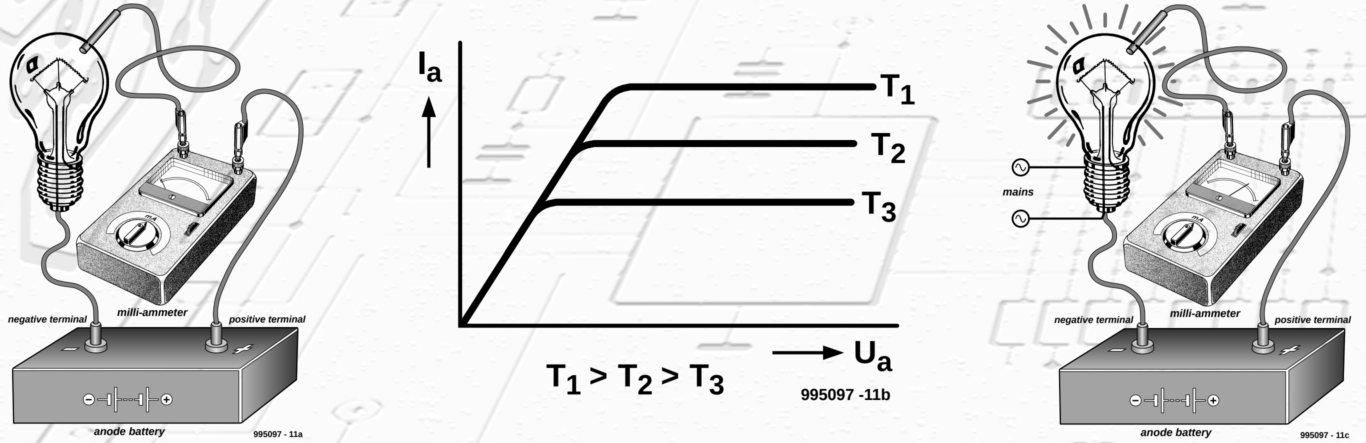

Principle of vacuum rectifier